



Digital Economy and Society Index (DESI) 2021

Finland

About the DESI

The European Commission has monitored Member States' progress on digital and published annual Digital Economy and Society Index (DESI) reports since 2014. Each year, the reports include country profiles, which help Member States identify areas for priority action, and thematic chapters providing an EU-level analysis in the key digital policy areas.

In 2021, the Commission adjusted DESI to reflect the two major policy initiatives that will have an impact on digital transformation in the EU over the coming years: the Recovery and Resilience Facility and the Digital Decade Compass.

To align DESI with the four cardinal points and the targets under the Digital Compass, to improve the methodology and take account of the latest technological and policy developments, the Commission made a number of changes to the 2021 edition of the DESI. The indicators are now structured around the four main areas in the Digital Compass, replacing the previous five-dimension structure. 11 of the DESI 2021 indicators measure targets set in the Digital Compass. In future, the DESI will be aligned even more closely with the Digital Compass to ensure that all targets are discussed in the reports.

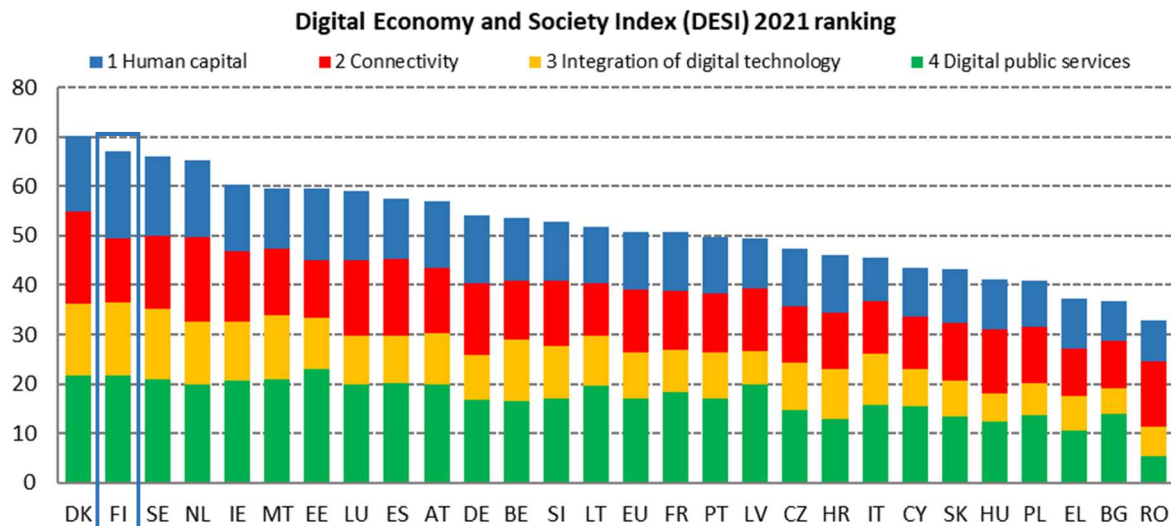
In addition, DESI now includes an indicator measuring the level of support that adopted ICT technologies provided companies in taking more environmentally friendly measures (ICT for environmental sustainability) and the take up of gigabit services, plus the percentage of companies offering ICT training and using e-invoicing.

The DESI scores and rankings of previous years were re-calculated for all countries to reflect the changes in the choice of indicators and corrections made to the underlying data.

For further information, see the DESI website: <https://digital-strategy.ec.europa.eu/en/policies/desi>.

Overview

	Finland	EU
	rank	score
DESI 2021	2	50.7



Finland ranks 2nd out of the 27 EU Member States in the European Commission's 2021 edition of the Digital Economy and Society Index (DESI). Finland continues to lead in human capital, integration of digital technology and digital public services, improving its scores in several DESI dimensions.

Finland excels in the availability and use of e-government services with high take-up by the public.

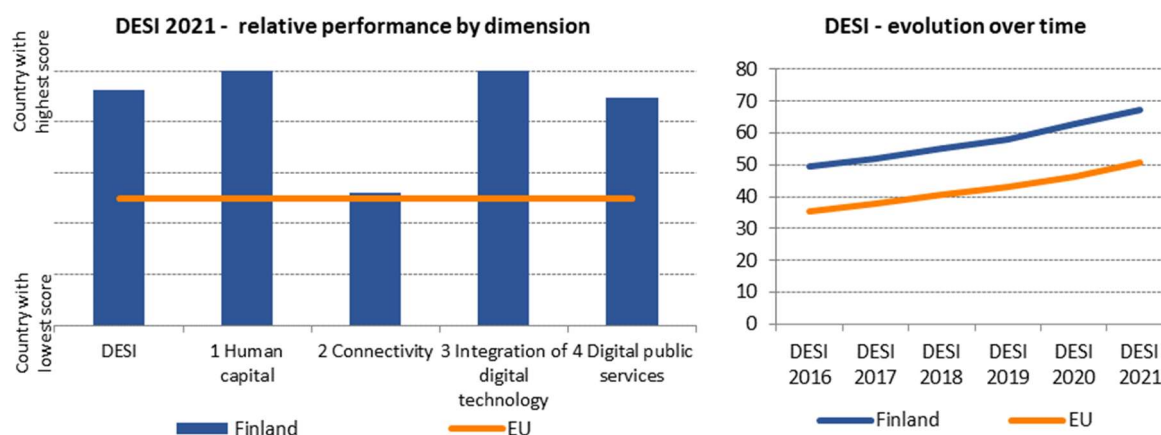
Finland strongly supports digital skills: the proportion of ICT graduates in the total number of graduates is almost double the EU average (7.4% vs. 3.9%), and almost twice as many enterprises provide ICT training (38% vs. 20% in EU). This is insufficient, however, as 59% of companies trying to recruit ICT specialists report hard-to-fill vacancies (EU 55%). These shortages could negatively affect the digitalisation of Finnish businesses.

Finland ranks 13th in connectivity with 57% overall fixed broadband take-up. This is partly due to the high usage of mobile internet in Finland, with 4G networks close to saturation in certain areas and a lead in 5G readiness with commercial deployments under way. A significant urban-rural divide exists, as does a gap characterised by low population density and vast areas with comparatively low economic incentive to roll out connectivity networks. The overall fixed very high-capacity network (VHCN) coverage is 67% (against 59% for the EU average), but this is very low (9.36%) in rural areas (27.8% EU average). Finnish SMEs perform well on a basic level of digital intensity and uptake of advanced technologies. Finland is well above the EU average in the integration of digital technology by businesses: 88% of Finnish SMEs have at least basic level of digital intensity (compared to the EU average of 60%), and 62% of all enterprises use cloud solutions, significantly more than the EU average (26%). Digital innovation hubs could expand business opportunities by linking up to European innovation hubs.

Several strategic programmes adopted in 2020 provided new impetus to digital policies. In February 2021, the government published the digital progress programme¹ as a framework for increasing the digital capabilities of the public sector and developing cooperation between the public and private

¹ <https://vm.fi/digitalisaation-edistamisen-ohjelma>.

sector. In October, Digivisio 2030² set out an implementation model and principles for deepening the digitisation of higher education institutions in Finland. In November, Finland updated its AI strategy with the artificial intelligence 4.0 programme³ to encourage the development and use of AI in companies.



Digital in Finland's Recovery and Resilience Plan (RRP)

In Finland's RRP, the contribution to digital objectives accounts for EUR 574.3 million, which represents 27.5% of the total allocation RRP. The focus of the plan is on public digital services, digital skills and digital transition of economy.

In the area of digital public services, measures include digitalisation in health and employment services, digitalisation of rail systems and the implementation of smart energy grids (in total over EUR 332 million).

Finland will also invest in data-driven innovation (EUR 37 million), cybersecurity (EUR 20 million), connectivity in the areas where the market mechanism cannot deliver (EUR 50 million), digital skills at various stages of education and life, and related digital public services (over EUR 50 million), deployment of advanced technologies and digital R&D&I (EUR 43 million), and the digitalisation of businesses, including SMEs, innovation infrastructures, and grants for businesses development (EUR 40 million). The Finnish RRP includes funds for the enterprises to participate in a multi-country project: the Important Project of Common European Interest (IPCEI) for microelectronics.

² <https://digivisio2030.fi/>.

³ <https://tem.fi/en/-/artificial-intelligence-4.0-programme-to-speed-up-digitalisation-of-business>.

1 Human capital

1 Human capital	Finland		EU
	rank	score	score
DESI 2021	1	71.1	47.1



	Finland			EU
	DESI 2019	DESI 2020	DESI 2021	DESI 2021
1a1 At least basic digital skills	76%	76%	76%	56%
% individuals	2017	2019	2019	2019
1a2 Above basic digital skills	45%	50%	50%	31%
% individuals	2017	2019	2019	2019
1a3 At least basic software skills	76%	77%	77%	58%
% individuals	2017	2019	2019	2019
1b1 ICT specialists	6.7%	6.8%	7.6%	4.3%
% individuals in employment aged 15-74	2018	2019	2020	2020
1b2 Female ICT specialists	20%	21%	23%	19%
% ICT specialists	2018	2019	2020	2020
1b3 Enterprises providing ICT training	36%	37%	38%	20%
% enterprises	2018	2019	2020	2020
1b4 ICT graduates	6.3%	7.0%	7.4%	3.9%
% graduates	2017	2018	2019	2019

Finland ranks 1st out of the 27 EU countries when looking at human capital. Its digital skills level is well above the EU average: 76% have basic skills and 50% have above-basic skills (against EU average levels of 56% and 31%, respectively). The proportion of employed people working as ICT specialists has increased to 7.6%, continuing to top EU rankings in this indicator. Finland's proportion of female ICT specialists is slightly above the EU average, at 23% (EU 19%). ICT graduates in Finland account for 7% of the total number of graduates, close to twice the EU average (3.6%). Almost twice the share of enterprises provides ICT training to their employees in Finland compared to the EU average. However, 59% of companies trying to recruit ICT specialists report hard-to-fill vacancies (EU 55%).

In 2020, Finland was managing the challenges of the COVID-19 crisis in education⁴. Schools and universities were closed from March 2020, prompting the replacement of in-person schooling by distance learning. The platforms and applications⁵ that schools were already using before the pandemic proved useful. To level up opportunities for all pupils, private companies were urged to donate laptops to students as part of the Device for All campaign⁶. Several companies provided e-learning materials at koulu.me with certified, free-of-charge, high quality pedagogical content crafted for distance learning.

⁴ <https://op.europa.eu/webpub/eac/education-and-training-monitor-2020/countries/finland.html>.

⁵ Examples: Helmi, Wilma, Studentapluus and Sopimuspro.

⁶ <https://www.oph.fi/fi/uutiset/2020/kaikille-kone-kampanja-haastaa-yritykset-lahjoittamaan-tarpeettomia-tietokoneitaan>.

Finland participated in the 2020 edition of EU Code Week, with 38 activities bringing together 3,000 of the overall 3.4 million participants⁷.

In higher education, the LUMA centre (an organisation boosting cooperation between schools, universities, and business) continued to motivate children to study STEM through the most up-to-date pedagogical methods. The implementation of the LUMA2020 programme⁸ supports lifelong learning for teachers and strengthens research-based teaching. In addition, the finna.fi search service that has previously brought together Finnish cultural and scientific material now offers new learning opportunities with open source, free educational resources. Digivisio 2030 is another long-term project prepared in 2020 to ensure flexible learning in Finnish higher education.

Digital skills feature in the continuous learning reform⁹ that the Finnish Parliament adopted in December 2020. This promotes opportunities for working age people to develop their competences and supports the availability of skilled labour. A digital service will be introduced that combines education and training, guidance and information on the labour market. The package includes mapping and identifying competence and career planning services as well as looking ahead to potential future opportunities. A set of intelligent e-services will operate as a platform for a continuous learning system.

Finland announced the simplification of administrative procedures, with an online service platform that brings together public and private services for foreign workers arriving in Finland. This is expected to include information on labour market opportunities, matching potential workers and employers, reliable sharing of data between the parties on the platform, and assistance in managing the administrative process. The project aims to help companies recruit ICT specialists for hard-to-fill vacancies.

Highlight: Digivisio 2030

The Digivisio 2030¹⁰ project is one of the decade's most significant digitalisation projects for higher education institutions in Finland. It aims to ensure flexible learning opportunities and improve the competitiveness of the higher education institutions globally. All higher education institutions pledged their contribution to the project in February 2020, agreeing on the project's implementation model and principles. The Ministry of Education and Culture has granted EUR 20 million as initial funding for the project, allocating a further EUR 17.8 million in strategic funding for 2021-2024.

Human Capital in Finland's Recovery and Resilience Plan

Several measures foster digital skills in the Finnish RRP. The plan includes a reform of continuous learning with a focus on vocational training (EUR 4.5 million). This is complemented by a targeted measure for Åland islands expected to introduce student-centred digital education in all higher

⁷ <https://digital-strategy.ec.europa.eu/en/news/eu-code-week-organisers-register-over-72000-activities-second-year-row>.

⁸ <https://www.luma.fi/en/news/2020/12/17/national-development-program-luma2020-brought-new-openings-materials-and-inspired-collaboration-between-schools-universities-and-industry/>.

⁹ <https://minedu.fi/en/-/common-policies-adopted-for-reforming-continuous-learning-securing-the-future-with-competence>.

¹⁰ <https://digivisio2030.fi/>

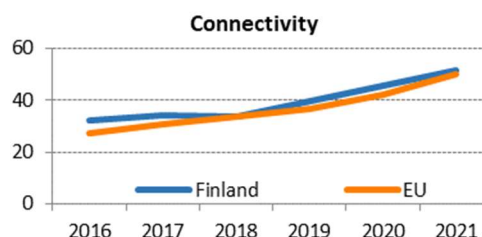
education studies and to introduce new study programmes in particular in the field of digitalisation and automation (EUR 2.4 million).

The plan, under the umbrella of digital public services, foresees a comprehensive digitalisation programme of the education, training and skills development system (EUR 46 million), which is expected to harness digital tools to raise Finland's level of digital competences and increase the effectiveness of the higher education system.

In the field of advanced technologies, an investment of 5 million has the objective to increasing basic cybersecurity skills of the general population through the creation of a common digital platform for teaching and developing cybersecurity skills. Another measure, also worth EUR 5 million, will fund cybersecurity exercises for at least 2,000 public officials.

2 Connectivity

2 Connectivity	Finland		EU
	rank	score	score
DESI 2021	13	51.3	50.2



	Finland			EU
	DESI 2019	DESI 2020	DESI 2021	DESI 2021
2a1 Overall fixed broadband take-up % households	58%	57%	57%	77%
2a2 At least 100 Mbps fixed broadband take-up % households	21%	23%	26%	34%
2a3 At least 1 Gbps take-up % households	NA	0.90%	0.95%	1.3%
2b1 Fast broadband (NGA) coverage % households	74%	75%	75%	87%
2b2 Fixed Very High Capacity Network (VHCN) coverage % households	31%	62%	67%	59%
2c1 4G coverage % populated areas	>99.9%	>99.9%	>99.9%	99.7%
2c2 5G readiness Assigned spectrum as a % of total harmonised 5G spectrum	67%	67%	99%	51%
2c3 5G coverage % populated areas	NA	NA	12%	14%
2c4 Mobile broadband take-up % individuals	74%	NA	NA	71%
2d1 Broadband price index Score (0-100)	NA	75	75	69

With an overall score of 51.3, Finland ranks 13th in the EU for Connectivity. Finland has a significant divide regarding fixed network coverage, which may be explained by the lack of economic incentives to roll out network in its sparsely populated areas. While Finland has very good total fixed very high-capacity network (VHCN) coverage (67% compared with an EU average of 59%), it scores low (9.3%) in rural areas (27.8% EU average). 'Fibre to the premises' coverage stood at 37.7%, below the EU average (of 42.5%) and almost on a par with cable networks upgraded to DOCSIS 3.1 (37.8%). The figures suggest that the two kinds of VHCN are complementary rather than in competition with each other.

Despite the good availability of VHCN, fixed broadband take-up is low at all speeds: 57% of households used fixed broadband (compared with an EU average of 77% of households), 26% of households had fixed broadband at 100 Mbps (compared to an EU average of 34%) and only 0.95% of households had fixed broadband at 1 Gbps (compared to an EU average of 1.3%). The low take-up does not appear to be correlated with price. Finland's broadband prices are good compared to those in other EU countries: its broadband price index stood at 75, above the EU average of 69. The low take-up of fixed

broadband may be explained by the choice of a considerable number of end users to switch to mobile broadband instead (fixed-to-mobile substitution)¹¹.

5G commercial service provision is available in several parts of the country. In 2019, operators began deploying networks in the 3.4-3.8 GHz spectrum band in mainland Finland. Commercial service provision expanded in Finland since 2019. The available 5G networks covered 12% of the country as of mid-2020¹².

Finland's national broadband plan, the digital infrastructure strategy, is being implemented. Finland is currently focusing on delivering at least the gigabit connectivity objectives. By 2025, all Finnish households should have access to a connection of at least 100 Mbps and it should be possible to increase connection speed to 1 Gbps.

The government has reserved EUR 5 million for 2021 to implement its national broadband plan. In addition, for very high-capacity connections in rural areas, resources from the European Agricultural Fund for rural development will also be available for 2021-2027. Decisions regarding the total amount of funds have not been made yet.

Finland has assigned 99% of the spectrum harmonised at EU level for wireless broadband. The 26 GHz spectrum was auctioned in June 2020. The winning bidders got 800 MHz of spectrum for EUR 7 million each: Elisa Corporation won the 25.1 - 25.9 GHz block, Telia Finland Oyj won the 25.9 - 26.7 GHz block and DNA Plc won the 26.7 - 27.5 GHz block. The 24.25 - 25.1 GHz frequency band was set aside from the auction, expected to be licenced for private local 5G networks in early 2021.

The 700 MHz band was auctioned in 2016 and is widely used for long-term evolution (LTE). The 3.4-3.8 GHz band was auctioned in 2018 and is currently used to offer 5G commercial services in several parts of the country as indicated above. Some spectrum coordination issues with a non-EU country have nevertheless been reported in the eastern part of the country. However, a new coordination Agreement regarding the 3.6-3.8 GHz band was signed in spring 2021, which reportedly improved the situation.

Main market & regulatory developments

In 2020, two new market players entered the Finnish telecommunications market: Valokuitunen Oy and Global Connect Finland. The former is a joint venture owned by CapMan Infra (60%) and Telia (40%). It has acquired Telia's open fibre networks and announced its intention to build open fibre networks for 200,000 households in the coming years, mainly in suburban areas with single dwelling houses.

Global Connect Finland is a Swedish fibre-based data communication and data centre services provider. Focusing on wholesale business customers, they intend to build fibre networks and provide high-performance connectivity and data storage services.

¹¹ Mobile broadband take-up stands above the EU average (it was already at 74% in 2018, before the EU average reached 71% in 2019)

¹² According to Traficom, at the end of 2020, 100 Mbps 5G connections were available to 67% of Finnish households, covering slightly more than 2% of the country's land area. Meanwhile, mobile networks offering speeds of 300 Mbps were available to 60% of households in about 1% of Finland's land area.

In terms of consumption patterns, the COVID-19 crisis increased the use of electronic communications services: the use of mobile data increased by 15% and mobile phone call minutes by 17%.

The Finnish voice call market features fixed-to-mobile substitution, with only 249,000 fixed telephone lines left in Finland, while the number of mobile subscriptions stands at 9.23 million.

The operators Elisa, Telia and DNA are the main market players in the fixed business market. Their national market shares for fixed broadband connections are Elisa 33%, DNA 31%, Telia 25%, Finnet Group 8% and others 3%.

Competition dynamics vary depending on the geographic area. While the three main operators still have high retail market shares in many regions, there is more competition in the Helsinki area, featuring increasing Fibre To The Building (FTTB) deployment by alternative operators.

On 18 January 2021, Finland notified the Commission of its complete transposition of the European Electronic Communications Code into national law. The Commission is assessing the completeness of the national implementing measures.

As for market regulation, Traficom reported that it is planning a new market analysis for markets 3 and 4 for wholesale high-quality access provided at a fixed location in the 2014 Recommendation on relevant markets.

On 12 November 2020, the highest administrative court decided to partly annul FICORA's decision from 2018 on significant market power in market 3a (market for wholesale local access provided at a fixed location) in relation to Elisa. The Court found that Ficora's decision was insufficiently reasoned. It held that the decision should have considered more precisely the fixed network competition in the capital and Tampere regions when delineating the geographical markets.

Furthermore, the Court annulled the decision on the pricing of the local loop market in all SMP areas. The Court's decision implies that the maximum wholesale monthly prices set by Ficora on Elisa Corporation's fibre local loops are lifted. It was ruled that the validity of the NRA's LRIC+ model's geotype segmentation and digging costs should have been investigated further.

The matter has been resubmitted to Traficom for reconsideration.

Finland chose to grant subscribers with fixed-term contracts for mobile services a higher level of consumer protection than the protection set out in Article 105(1) of the code. While the code provides that contracts should not mandate commitment periods exceeding 24 months, the national implementing measure for Article 105(1) of the code stipulates that fixed-term contracts for mobile services should not mandate commitment periods longer than 12 months.

Regarding universal service, Finland is planning to increase the minimum data speed of the right to internet connection from 2 Mbit/s to 5 Mbit/s.

Finland is a leader in 5G readiness and has begun commercial deployment.

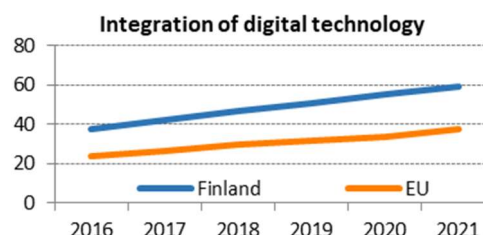
Further spectrum resources have been made available through auctioning the 26 GHz band. The country's fixed broadband coverage is good. Nevertheless, fixed coverage in rural areas could be improved. The main problem has been a lack of incentives for market players to invest in the country's sparsely populated areas. Finland relies on the allocation of public funding to continue implementing its national broadband plan and achieve ubiquitous VHCN coverage throughout the country.

Connectivity in Finland's Recovery and Resilience Plan

The Finnish plan includes an investment support scheme to increase the quality and availability of high speed connectivity network in areas where such connections are not provided by the market mechanisms. Financial support amounting to EUR 50 million will be disbursed to broadband providers. The broadband connections supported under this scheme will offer at least a capacity of 100 Mbit per second. Additionally, Finland is expected to establish a coordinator position in the National Broadband Office with the aim of promoting broadband and planning the coordination of national and EU broadband.

3 Integration of digital technology

3 Integration of digital technology	Finland	EU
rank	score	score
DESI 2021	1	59.5
		37.6



	DESI 2019	Finland DESI 2020	DESI 2021	EU DESI 2021
3a1 SMEs with at least a basic level of digital intensity % SMEs	NA	NA	88%	60%
3b1 Electronic information sharing % enterprises	39%	43%	43%	36%
3b2 Social media % enterprises	29%	44%	44%	23%
3b3 Big data % enterprises	19%	19%	22%	14%
3b4 Cloud % enterprises	50%	50%	62%	26%
3b5 AI % enterprises	NA	NA	20%	25%
3b6 ICT for environmental sustainability % enterprises having medium/high intensity of green action through ICT	NA	NA	77%	66%
3b7 e-Invoices % enterprises	79%	79%	83%	32%
3c1 SMEs selling online % SMEs	20%	22%	18%	17%
3c2 e-Commerce turnover % SME turnover	NA	NA	NA	12%
3c3 Selling online cross-border % SMEs	6%	9%	9%	8%

Finland ranks 1st among EU countries, well above the EU average on the integration of digital technology by businesses.

Some 88% of Finnish SMEs have a at least basic level of digital intensity, which is higher than the 60% EU average. On ICT for environmental sustainability, Finland records 77% of enterprises having medium/high intensity of green action through ICT, a value above the EU average of 66%. Advanced technologies continued to gain popularity among Finnish enterprises, with 62% using cloud solutions, a notable jump from 50% 2 years before (and significantly more than the EU average). 20% of enterprises integrate AI technology in their operations and 43% use electronic information sharing. The use of social media by enterprises is nearly twice as high as the EU average (44% v 23%), while e-invoice use by enterprises is very common (83%), which is not the case for the EU on average (32%).

Building on previous years' experience and policy preparations, the government launched the digital progress programme¹³ in February 2020. It aims to increase technology and digitalisation capabilities in the public sector and to develop cooperation between the public and private sectors, integrating digital tools in the economy and in society. In particular, the YritysDigi¹⁴ aims to decrease the need for face-to-face contacts and paper documents.

In line with Finland's public policy tradition of continuity of organisation and funding instead of ad hoc initiatives, several well-structured projects continued to be implemented. The principal policy implementing body remains the Business Finland¹⁵ governmental agency. It manages programmes like the Kasvumootorit (growth engines) that supports the use of data and the development of digital platforms, the Venturi, funding RDI for leading companies in digital ecosystems and Smart Mobility (EUR 50 million). The VTT Technical Research Centre of Finland provides funding for the digitalisation of industry, and the multi-annual 2018-2022 digital Finland framework¹⁶ is being implemented for the digital transformation of local governments, with EUR 400 million over the whole period.

Finland developed its AI strategy in 2017. On that basis, the artificial intelligence programme was implemented through funding for the AI business programme (EUR 100 million) and the Finnish Centre for Artificial Intelligence (FCAI, EUR 8.3 million — both figures apply to 2019-2022). In November 2020, Finland revised and updated its AI strategy with the artificial intelligence 4.0 programme¹⁷. It encourages the development and introduction of AI in companies with particular emphasis on SMEs. AI is to be embedded in a wide array of other technologies, such as the internet of things, 3D printing, robotics, quantum computing, virtual and augmented reality. Finland is a member of the EuroHPC Joint Undertaking and will host one of the three pre-exascale supercomputers¹⁸. It is a signatory of the Declarations on European Blockchain Partnership and Artificial Intelligence.

Finland performs well in the integration of digital technologies by businesses. The challenges seem to be in improving the international reach of its companies and in reskilling and upskilling the labour force with advanced digital skills. The country is at the cutting edge of technology and keeping this position will require consistent work.

Integration of digital technology in in Finland's Recovery and Resilience Plan

Finland's RRP foresees several measures to support the integration of digital technologies into the public and private domains. The support for renewal in the cultural and creative sectors aims at the digital transformation of those companies, growth acceleration programme for small enterprises, and special focus on digital growth in the tourism sector.

In the field of advanced technologies, the RRP provides for actions to strengthen the applied research deployment of advanced technologies, particularly 6G, artificial intelligence and quantum computing (EUR 10 million). Support will also be provided to accelerate and increase Finnish companies' investments in the development of the production value chain of microelectronics, increase the ability to design and manufacture semiconductor components in Finland and the EU thanks their expected participation in the Important Project of Common European Interest (IPCEI) for microelectronics (EUR 15 million). Finally, the plan includes a number of RDI funding packages to support innovative growth companies and to promote digital innovation.

¹³ <https://vm.fi/digitalisaation-edistamisen-ohjelma>.

¹⁴ <https://vm.fi/yritysdigi>.

¹⁵ <https://www.businessfinland.fi/>.

¹⁶ <https://www.businessfinland.fi/496a6f/globalassets/julkaisut/digital-finland-framework.pdf>.

¹⁷ <https://tem.fi/en/-/artificial-intelligence-4.0-programme-to-speed-up-digitalisation-of-business>.

¹⁸ <https://www.lumi-supercomputer.eu/>.

4 Digital public services

4 Digital public services	Finland		EU
	rank	score	score
DESI 2021	3	86.7	68.1



	DESI 2019	Finland DESI 2020	DESI 2021	EU DESI 2021
4a1 e-Government users % internet users	87% 2018	91% 2019	91% 2020	64% 2020
4a2 Pre-filled forms Score (0 to 100)	NA	NA	97 2020	63 2020
4a3 Digital public services for citizens Score (0 to 100)	NA	NA	87 2020	75 2020
4a4 Digital public services for businesses Score (0 to 100)	NA	NA	93 2020	84 2020
4a5 Open data % maximum score	NA	NA	85% 2020	78% 2020

In digital public services, Finland ranks 3rd among EU countries, well above the EU average. Online interaction between government authorities and the public approach the maximum, with 91% of Finnish internet users using e-government services, the same as last year. The country also performs very well in relation to the availability of pre-filled forms (97%), and online services for both the public and enterprises (scores of 87 and 93, compared to EU averages of 75 and 84, respectively).

In 2020, the major change in the architecture of e-government services consisted in the launch of the Digital and Population Data Services Agency¹⁹ on 1 January 2020. The merger of the Population Register Centre, the Local Register Offices and the Steering and Development Unit for the Local Register Offices was prepared in legislation before the outbreak of the pandemic and the integration was carried out during that year. The Agency provides data from the registers for government bodies, companies and citizens.

The Valtori e-government centre²⁰ that provides various ICT services for central government and facilitates inter-governmental cooperation played a crucial role during the COVID-19 crisis. A major switch to remote working by central government was made possible by increasing the capacity of systems and organisational measures. The situation also required management changes, as the Board of Directors was dissolved, and the Ministry of Finance took over its direct supervision. As a precautionary measure, a review of the organisation of security network operations was conducted to identify and analyse options for the future.

¹⁹ <https://dvv.fi/en/digital-and-population-data-services-agency>.

²⁰ <https://valtori.fi/en/-/year-2020-valtori-s-customer-and-personnel-satisfaction-increased-in-the-midst-of-the-pandemic>.

The national open data portal²¹ continues to provide data in open formats for companies and members of the public. Examples of the applications using this data range from collecting and analysing invoices from municipalities to inform citizens about the activities of these institutions (*Handata*²²), to making predictions on when blueberries would be ripe for harvesting, based on locally gathered information and the meteorological institute forecasts (*Mustikkaan*²³). However, the open data indicators²⁴ show that, unlike other metrics, Finland is not among the countries that make most use of this data. Given the experience of public institutions rarely making funds available for opening their data, central government has carried out a programme to encourage wider and more efficient use of public data for societal and economic purposes, to be implemented in 2020-2022.

In June 2020, to support the implementation of the cyber security strategy (2019), the government published a resolution on digital security in the public sector²⁵ that sets out the development principles and key services to be considered to increase resilience in cybersecurity. Within the framework of comprehensive security, the goal is to protect members of the public communities, and society from threats to information, services and the functioning of society online. The 2020-2023 action plan for digital security in the public administration (*Haukka*²⁶) describes how the resolution will be put in practice. Cybersecurity has also received funds in relation to broader e-government, for instance the EUR 100 million project on a digitalisation, experimentation and deregulation strategy for public sector ICT.

Compared to the EU average, Finland is a stellar performer on most e-government indicators. The main challenge remains to keep abreast of the fast pace of technology. State-of-the-art solutions are in place and people are reportedly pleased with most services provided. However, government analyses show increasing threats to cybersecurity and new challenges brought about by AI applications. These require constant adjustments in the digital aspects of Finland's public administration.

Digital Public Services in in Finland's Recovery and Resilience Plan

The Finnish RRP includes significant investments in the digitalisation of public administration and improvement of digital public services for the public and businesses.

Following the pandemic, the plan envisages important investments to complement the ongoing reform of the social and health care sector, introducing a wide range of digital innovations and eHealth projects (with a total value of EUR 145 million), including contacts with patients handled remotely by electronic means. This also includes digital solutions enabling remote diagnoses, monitoring and treatment of diseases; supporting early identification of problems and increasing the use of preventive services; enabling a wider range of multidisciplinary services and expertise to be shared between different regions and service providers, with a strengthened role of their customers.

The reform of the public employment services process also encompasses important digital innovations (EUR 40 million) to support the development of personalised and integrated services for job-seekers, thereby increasing active labour market integration. A digital information system

²¹ <https://www.opendata.fi/>.

²² <https://handata.fi/>.

²³ <https://mustikkaan.fi/>.

²⁴ https://data.europa.eu/sites/default/files/country-factsheet_finland_2020.pdf.

²⁵ <http://urn.fi/URN:ISBN:978-952-367-337-3>

²⁶ <https://julkaisut.valtioneuvosto.fi/handle/10024/162290>.

will be developed to support inter alia customer relations management, appointment booking, self-reporting by job seekers and online guidance.

The plan also includes several measures promoting the digitalisation of public administration, with a focus on data-driven innovation, the exchange of digital information and use of public sector data. This includes a measure to streamline the administrative procedures for processing residence permit applications attracting international talent (EUR 20 million). A virtual platform, 'Virtual Finland', will offer a single gateway to electronic services of different ministries and agencies for persons arriving in Finland (EUR 9 million). In addition, electronic solutions for the prevention of money laundering (EUR 10 million), focussing on the automation of data processing and analysis. The roll-out of a system of real-time structured exchange of digital financial data such as e-invoices or procurement documents will benefit the competitiveness of both the public and private sector (EUR 14 million). The creation of residential and commercial property information system (EUR 14 million) will help strengthen the monitoring of household debt.

Furthermore, the plan contains investments in the digitalisation of rail transport (EUR 85 million) encompassing the preparation and carrying-out of testing and piloting activities that will lead to the introduction of the European Rail Traffic Management System (ERTMS), along with the 4G and 5G-based Future Railway Mobile Communication System (FRMCS).